

II.—Some new Species of Cyprinoid Fish from Mysore.

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[Plates I. & II.]

THE material described in this paper was collected from the Cauvery in Seringapatam, the Thunga in Shimoga, and from the local tanks, chiefly during the summer recess of 1917-18. In the course of a visit paid to the northern and south-western parts of Coorg in the colder months of the latter year, a very large number of examples was procured from several interesting sources. Through the courtesy of Dr. N. Annandale, to whom my thanks are due, I was enabled to examine the collections, at present available, of *Garra*, *Botia*, and *Nemachilichthys* belonging to the Zoological Survey of India in the Indian Museum. To that distinguished ichthyologist, Dr. B. L. Chaudhuri, I am deeply indebted for the numerous acts of help, which I have received from him.

Before proceeding to describe my examples, which belong to the three genera *Garra*, *Botia*, and *Nemachilichthys*, I propose to add a brief discussion regarding the use of the term *Garra* in preference to *Discognathus*. In his preliminary publication on 'The Genera of Fishes'*, Jordan proposes the revival of the old (generic) name of *Garra*†, originally applied by Hamilton Buchanan to that group of Cyprinine Fishes still included by some authors under Häckle's denomination of *Discognathus*. On resumption of its labours, the International Congress of Zoology is bound to discuss the whole question of ichthyological taxonomy, and it is more than probable that Jordan's recommendations, which are based on recent use by numerous writers, will be upheld. In view of the vicissitudes to which the generic and specific terms are frequently subjected by systematic writers, it is very desirable that some sort of stability be secured for the zoological nomenclature, as otherwise there is bound to be a great deal of confusion to the future investigators. There can be little doubt that Hamilton Buchanan employed the term *Cyprinus*‡ in a broad sense comprising a very large number of fish, though

* 1917. Jordan, 'The Genera of Fishes' (Stanford University, California), p. 115.

† 1822. Hamilton Buchanan, Fish. Ganges, pp. 343, 393.

‡ 1822. *Id. op. cit.* p. 256.

with very little generic affinity; and obviously, in any modern systematic work on Fishes, his term *Cyprinus* would correspond in regard to inter-relationships to the subfamily Cyprininae* (family Cyprinidae). It is also evident that this must have been his meaning, for he employs "Divisions" within his "genus" *Cyprinus*, and these "Divisions," though not strictly defined, yet bring together forms of fish which are nearly allied to each other and whose common characteristics undoubtedly constitute the basis of the "Divisions." The common name given by Buchanan to each of these "Divisions" is founded on some vernacular appellations; and the conclusion cannot be resisted that Buchanan's "Divisions" therefore correspond to the "genera" of modern systematic ichthyologists.

Accordingly, "*Cyprinus garra*"† is only used by its author as a generic designation for *Garra* itself, which includes a number of stone carps. This position is perfectly tenable, and the species *Cyprinus lamta* (*Discognathus lamta*), which Buchanan describes as a *Cyprinus* of the *Garra* kind with four tendrils, should be obviously written *Garra lamta*, H. B.‡. Günther§ regards this term as "an odd compound" without any claim to anything like an artificial or natural genus, and he is opposed to Bleeker's || adoption of what he calls a barbarous denomination (*Garra*) in preference to the more classical term *Discognathus*. Now, it was inevitable that, with the literature available to Buchanan¶, and having to deal with a quantity of material under the circumstances in which he worked, he should have proposed a scheme of classification which rather appears, to later investigators more fortunately placed, to suffer from certain defects of terminology. Neither this fact nor the other one—viz., that *Garra* is not a latinised term—will deprive Buchanan of the authorship of a valid genus capable of being used for all scientific taxonomic purposes. Besides Bleeker, who, in following Buchanan, employed *Garra* as a generic term for the description of a stone carp from Ceylon** (*Garra ceylonensis*, Blkr.), Day

* 1889. Day, Fauna Brit. Ind., Fishes, i. p. 238.

† 1822. H. Buchanan, *op. cit.* p. 343.

‡ 1919. Records Ind. Mus. vol. xvi. pt. i. p. 130 (Dr. Annandale regards Day, and not Buchanan, as the author of *lamta*).

§ 1868. Günther, Cat. Brit. Mus., Fishes, vii. p. 68.

|| 1864. Bleeker, Mehn. Soc. Holland, Harlam, Cobit. & Cyprin. Ceylon, p. 8.

¶ 1918. Chaudhuri, Journ. & Proc. As. Soc. Bengal, vol. xiv. no. 6, p. cxlv.

** 1864. Bleeker, *op. cit.* p. 8, and 1864. Zool. Rec. Pisces, p. 171.

also adopted it far more widely for a similar purpose in dealing with fish of the *Garra* kind mainly from the Malabar area of the Peninsular India. *Garra malabarica* *, Day, *Garra alta* †, Day, and *Garra jerdoni* ‡, Day, are some of his examples. Bleeker and Day are not, however, the only authors who recognised the genus *Garra*, for Steindachner § among the Germans had also employed it, regarding *lamta* as its type-species. Another species of *Garra*, also referred to by this author, is *Garra gotyla*, Gray ||. Among the more recent writers on the subject, we find Fowler (*G. borneensis*) ¶ and Berg (*G. persica*) ** recognising the valid term *Garra* of Buchanan, though there are a few who still try to revive the obsolete name of *Discognathus* ††. *Platycara* ‡‡, *Gonorhynchus* §§, and *Mayoa* ||| have been also employed as generic terms by certain systematists, and some, at any rate, are now treated practically as synonymous with *Discognathus*. McClelland simply regarded that his *Platycara* is synonymous with Gray's *Balitora* ¶¶. The eligibility of the generic term *Gonorhynchus*, which was introduced by Scopoli into the Linnean nomenclature, is, however, disputed as not conforming to the Linnean Code, since no type was indicated by Scopoli while introducing the generic title into the binomial terminology. Still Jerdon freely used this generic term in his description of certain Cyprinine fish from S. India, such as *Gonorhynchus McClellandi*, Jer., *Gon. gotyla*, Jer., and *Gon. stenorhynchus*, Jer.***. Of the three generic terms *Gonorhynchus* (1763), *Garra* (1822), and *Platycara* (1838), Günther (1868) rejects the first and treats the latter two denominations as synonymous with *Discognathus* (1843). *Mayoa* (1869), being of later date, is not referred to by him. As Dr. Annandale informs me, it is possible that on the basis of anatomical characters two distinct genera may have ultimately to be recognised, and in that case the more appropriate generic

* 1865. Day, Proc. Zool. Soc. p. 297, and 1865. Fishes, Malabar, p. 205.

† 1867. *Id. tom. cit.* p. 349.

‡ 1867. *Id. loc. cit.*

§ 1867. F. Steindachner, SB. Ak. Wiss. Wien, vol. lvi. i. p. 36.

|| 1867. *Id. loc. cit.*

¶ 1905. Fowler, Proc. Acad. Nat. Sci. Phil. vol. lviii. p. 482.

** 1913. Berg, Ann. Mus. Zool. St. Petersburg, vol. xviii. p. lxi.

†† 1914. Regan (*Discognathus wanæ*), Ann. & Mag. Nat. Hist. (8) xiii. p. 263, fig. A.

‡‡ 1838. McClelland, Journ. As. Soc. Bengal, vol. vii. no. 6, p. 944.

§§ 1763. Gronow Zoophylaceum.

||| 1869. Day, Proc. Zool. Soc. p. 553.

¶¶ 1838. McClelland, *tom. cit.* p. 947.

*** 1849. T. C. Jerdon, Madras Journ. Lit. Sci. no. 35, pp. 309-10.

name will be *Garra* for the species occurring in Baluchistan, India, Burma, Malayan Peninsula, and perhaps Borneo, while *Discognathus*, if it is established to be generically distinct from *Garra*, may be confined to species met with in N.E. Africa, Arabia, Asia Minor, and Persia. In settling all questions relating to terminology, the law of priority has been relied upon usually as a safe guiding principle, and, if any valid generic term conforms to the Linnean Code, there is no sufficient reason why it should be suppressed or the law of priority itself ignored. If the matter of acceptance or rejection of any term should, however, become purely arbitrary, then, as Jordan states, there can be no finality in such a case. There is therefore every justification for the general adoption of Buchanan's generic designation of *Garra*, which, as has been pointed out already, has been used as such by Bleeker, Steindachner, Day, Fowler, and Berg more prominently. I also agree with Jordan that *lamta** is the type of the genus *Garra*, since it has been regarded by Buchanan as the representative species for his "Division *Cyprinus garra*," and also being the first species described by him under this genus. I accordingly use the term *Garra* in the place of *Discognathus*, which I think is the correct procedure, at least so far as one has to deal with forms occurring within the Indian Empire, Ceylon, and Malayan Peninsula.

Buchanan's description of his Division *Cyprinus garra* is too brief and bald to be of any definitive value, and, having examined the somewhat rich material† in the Indian Museum, collected from various localities, and my own examples taken in equally interesting sources, I consider that the generic definition of *Garra* (*Discognathus*, part.), given by Günther and Day, requires revision—at least, in certain particulars. I proceed to append the following diagnosis, which I must state is applicable strictly to forms occurring within the limits prescribed above:—

Subfamily CYPRININÆ.

Genus GARRA, Hamilton Buchanan (1822).

- 1763. *Gonorrhynchus*, Gronow (rejected).
- 1838. *Platycaia*, McClelland.
- 1843. *Discognathus* (part.), Häckel.
- 1864. *Discognathus* et *Lissorhynchus*, Bleeker.
- 1869. *Majoa*, Day.

* 1917. Jordan, *op. cit.* p. 115, & 1868. Günther, *tom. cit.* p. 68.

† 1918. Annandale, *Rec. Ind. Mus.* vol. xiv. p. 45. If the specimens of *Discognathus*, belonging to the collection of the Indian Museum now held up in Budapest, were also available, our position in regard to several species would have been certainly very much clearer.

Stone carps with a cylindrical or subcylindrical body, covered by scales either moderate or large*. Head never large, snout rounded, bearing mucous pores or spiny tubercles, chiefly in adult males, with or without a protuberance between or outside each nostril†. Mouth ventral crescentic with both lips well developed, the upper usually fringed and the lower invariably developed into a powerful adhesive disk‡; barbels short, usually four, sometimes only two or absent§. Pharyngeal teeth uncinatc, in three closely approximate rows—2, 4, 5/5, 4, 2 or 5, 3, 1/1, 3, 5. Dorsal fin without osseous ray, upper margin slightly emarginate or deeply notched, commencing in front of the ventrals. Pectorals always horizontal, rarely exceeding the length of the head. Anal scales not generally differentiated.

Distribution.—Fresh-water forms inhabiting tanks, rivers, and hill-streams throughout the Indian Empire, Ceylon, Malayan Peninsula, and Borneo.

Synopsis of species of *Garra* collected up till now in the Mysore State and Coorg (S. India):—

1. *Garra lamta*, H. B.
2. *Garra jerdonia*, Day.
3. *Garra stenorhynchia*, Jerdon.
4. *Garra jerdonia brevimentalia*, var. n., Rao.
5. *Garra platycephala*, sp. n., Rao.
6. *Garra bicornuta*, sp. n., Rao.

SYSTEMATIC ACCOUNT OF THE SPECIES.

1. *Garra lamta*, H. B.

1822. *Cyprinus lamta*, H. Buchanan, *op. cit.* pp. 343, 393.

1841. *Chondrostoma mullya*, Sykes, Trans. Zool. Soc. ii. p. 359.

1868. *Discognathus lamta*, Günther, *op. cit.* p. 69.

1869. *Mayoa modestus*, Day, Proc. Zool. Soc. p. 553.

1871. *Discognathus modestus*, Day, Journ. As. Soc. Bengal, (2) xi. p. 108.

1878. *Discognathus lamta*, Day, Fish. Ind. Text. vol. ii. p. 527.

* *Garra borneana*, Vaill., and *G. bicornuta*, sp. n., Rao, have larger scales than most Indian species.

† Two protuberances so far known only in *G. bicornuta*, Rao.

‡ Feebly marked in *G. adisca*, Annan, Rec. Ind. Mus. 1919, vol. xvi. p. 68. This is a very variable structure, whose degree of development depends on the conditions amidst which the species lives.

§ *G. imberbia*, Vincig., from Burma, has no barbels (Ann. Mus. Genova, 1889, (2) ix. (xxix.) p. 281); and *G. variabilis*, Häck., has only two, perhaps occurring within the limits of the Indian Empire (Journ. As. Soc. Bengal, (n. s.) ii. p. 8 (1906)).

1890. *Discognathus lamta*, Vinciguerra, Ann. Mus. Genova, (2) ix. pp. 275-279.
 1909. *Discognathus lamta*, Jenkins, Rec. Ind. Mus. iii. p. 290.
 1913. *Discognathus lamta*, Annandale, Journ. & Proc. As. Soc. Bengal, (n. s.) ix. p. 36.
 1919. *Discognathus lamta*, id. Rec. Ind. Mus. vol. xvi. p. 131.
 1919. *Discognathus kangrae*, Prashad, Rec. Ind. Mus. vol. xvi. p. 163.

This is perhaps the commonest species of *Garra* in the tanks and rivers of Mysore and Coorg, and also the one which exhibits extremes of individual variability. The mental disk, the dorsal, pectoral, and caudal fins, and eyes are chiefly affected by the modifying influences like still water or rapid torrents, shallow rock pools, or deep cavernous pits in the beds of rivers. This circumstance, together with the variability of scales and perhaps want of fresh or well-preserved specimens from widely different localities, must largely account for the differences of opinion regarding *lamta*. Dr. Annandale* writes: "I give Day and not Buchanan as the author of the former (*D. lamta*), because it is impossible to be sure as to the species to which Buchanan first applied the name *Cyprinus lamta*." And again he writes: "But there is some doubt as to whether Buchanan's *Cyprinus lamta* was not rather the form called *D. modestus* by Day and *Platycara nasuta* by McClelland"*.

There can be no doubt as to the indications which Buchanan has left behind him in regard to what he meant by *lamta*. In his manuscript drawings there is figure of *lamta*, though the name written by Buchanan, in his own handwriting, is *Cyprinus godiyari*. In his notes on Bhagalpur District, published in vol. xx. of the Statistical Account of Bengal, he refers to this *C. godiyari*, and further in his notes on Gorakhpur District (p. 105) he mentions that the *C. godiyari* of Bhagalpur is the same as *C. lamta* of Gorakhpur.

Accordingly, there can be no doubt whatsoever as to what Buchanan's *C. lamta* is, as described in his 'Fishes of the Ganges' (1822). It may be further stated that the MSS. drawing referred to is the protograph †, and having compared the descriptions of Buchanan and of Day, with the help of the material in the Indian Museum and in my own collection, I arrive at the conclusion that the *lamta* of Day is identical with the *lamta* of Buchanan.

* 1919. Rec. Ind. Mus. vol. xvi. pp. 130, 131.

† I am indebted to Dr. B. L. Chaudhuri for this information. In an addendum to his paper "On the Fish of the Genus *Discognathus*" (Rec. Ind. Mus. vol. xviii. p. 77, 1919) Dr. Annandale briefly discusses the same point, and acknowledges information to the same authority.

Further, Day's *lamta* is considered to be the same as his *modestus* by Jenkins *, with whom I entirely agree. Dr. Annandale †, however, regards the latter, possibly on the basis of six anal fin-rays, as synonymous with McClelland's *nasutus*, thus agreeing with Günther in assigning it the rank of a separate species in opposition to Day. In discussing the specific distinctions of *nasutus*, Dr. Annandale ‡ notices that a greatly enlarged adhesive organ (c), and the simple and flattened outer pectoral rays (e), form exclusive characters, and I may point out that several examples of *lamta* obtained from the rapid streams, like the Harangi in Coorg, show these very characters, which accordingly may be disregarded. Then the other character—viz., six anal fin-rays on which Day separates his *lamta* and *jerdoni* from *modestus*—is uniformly common in several examples of *lamta*, both in my collection and in that of the Indian Museum, and I may state that this is also the experience of Jenkins. The other specific characters mentioned by Day for his *modestus*, as Jenkins has pointed out, also break down when a very large number of examples of *lamta* from widely different localities are examined, and, as I am unable at present to discover any sufficient ground for separating Day's *modestus* from his *lamta*, I have in this paper treated the former as synonymous with Buchanan's *lamta*. In the absence of more material than is available at present in the Indian Museum, it is difficult to say whether *nasutus* is only a local race of *lamta* or a new species.

I rewrite the formula for *Garra lamta* of its fin-rays and lateral transverse rows of scales thus:—

D. 10-11 (2-3.2/8-9). P. 15. V. 9. A. 6-7 (1-2/5).

C. 17-19. L. 1. 30-37. L. tr. 4-4½/3½-4½.

(1) Specimens with spine-covered mucous glands on the snout are not peculiar to the Salt Range in the Punjab or the Chumba District §; they commonly occur in Mysore and Coorg.

(2) The occurrence of a spiny protuberance is a purely secondary sexual character.

(3) A greatly enlarged mental disk and an expansive pectoral fin, with a larger number of simple rays, are associated with forms occurring in the rapid streams.

* 1909. Jenkins, *op. cit.* p. 292.

† 1919. Annandale, *Rec. Ind. Mus.* vol. xvi. p. 132.

‡ 1919. *Id. op. cit.* p. 133.

§ Day, *Fishes—Fauna*, Brit. Ind. vol. i. p. 246.

(4) Younger specimens possess an interesting scheme of coloration, in which the orange is confined to the fins more often than not*.

The description of *D. kangrae* † suffers from certain defects—for example, the number of caudal fin-rays is not indicated, and it is not clear whether or not the length of the caudal fin is included in the total length of the body. The dorsal profile behind the dorsal fin is described as being slightly concave and the upper lip as being fairly broad. These descriptions do not conform to the protograph. I have examined the type and syntypes of this species in the Indian Museum, and find that the lateral and transverse series of scales—viz., 35 and $4\frac{1}{2}$ respectively—are correctly represented in the text-figure, and not 34 and $\frac{4}{5}$ as stated in the description. The caudal fin-rays are 19. The reasons for considering *kangrae* as a separate species by its author are—(1) the proportions of the different parts of the body, (2) the shape and size of mental disk, (3) the situation of the eye, and (4) the shape of the tail and dorsal fin. As I have already stated that characters 2 and 4 are very variable among *lamta*, it would be risky to consider them to be of specific importance. The measurements of *kangrae* I have taken are as follows (measurements in hundredths of total length without caudal fin):—

	<i>kangrae</i> .	<i>lamta</i> .
	mm.	mm.
Total length without caudal fin	95	95
Depth of body	22.1	22.6
Depth of caudal peduncle	12.6	12.7
Depth of head at occiput	18.9	19.1
Length of head	24.1	23.6
Width of interorbital space	16.7	16.9
Length of snout	13.6	13.0
Diameter of orbit	4.2	4.2
Length of caudal peduncle	17.8	17.9

It will be seen from the above measurements of the two species (I have taken a well-preserved *lamta* of the same size for comparison) that the only real point of difference between *lamta* and *kangrae* is the relative length of head, which, I consider, is too insufficient a basis for founding a new species upon. Till more material is forthcoming, when

* *Vide* description of *Garra malabarica*, Day, 'Fishes of Malabar,' p. 206, pl. xv. fig. 1. This is the usual coloration of younger forms of *G. lamta*, which fades in the preserving fluids.

† 1919. Prashad, *op. cit.* text-figs. p. 164.

kangræ may perhaps be considered as a variety of *lamta*, I propose to treat *kangræ* as synonymous with *lamta*. It is needless to observe that the other differences in the measurements must be due to conditions of preservation, food, and maturity of the specimens. The formula of rays and scales for *kangræ* is almost the same as for *lamta* *.

2. *Garra jerdonia*, Day.

1878. *Discognathus jerdoni*, Day, Fish Ind. Text. ii. p. 528.

1909. *Discognathus jerdoni*, Jenkins, Rec. Ind. Mus. vol. iii. p. 291.

1919. *Discognathus jerdoni*, Annandale, Rec. Ind. Mus. vol. xvi. p. 132.

1919. *Discognathus jerdoni*, Annandale, Rec. Ind. Mus. vol. xvii. p. 73, pl. ix. figs. 1, 2, and pl. xi. fig. 3.

My specimens of *jerdonia* have been taken chiefly in the rapidly running waters of the Cauvery, both in the Mysore State and Coorg. Having examined a fairly large collection of this species, I think it is impossible to maintain with Günther that it is identical with *lamta*. As Dr. Annandale proposes to discuss this and the following species in his forthcoming paper, I content myself here with recording their occurrence in Mysore, hoping for a future opportunity for offering such remarks on them as may be called for.

3. *Garra stenorhynchia*, Jerdon.

1849. *Gonorrhynchus stenorhynchus*, Jerdon, Mad. Journ. Lit. Sci. p. 310.

1919. *Discognathus stenorhynchus*, Annandale, Rec. Ind. Mus. vol. xvii. pl. ix. fig. 3, pl. xi. fig. 4.

Jerdon's account of this species, obtained in the Bhavani River (foot of the Nilgiri Hills) and the streams of Malabar, is absolutely brief. My specimens, which were obtained from the rocky pools in the Cauvery (Seringapatam), show a relatively larger internasal protuberance studded with spiny mucous pores, the upper lip thick and suetorial, the upper surface of the head proportionately much broader, and a greatly enlarged mental disk.

* I have, since writing the above, noticed that *kangræ*, Prashad, is regarded by Dr. Annandale (1919, *op. cit.* p. 74) as a subspecies of *jerdoni*. "This form seems to be no more than a local race of *D. jerdoni*. Day, distinguished by its longer head and smaller eye." I consider, for the reasons given above, that it is more correct to treat it as a subspecies of *lamta*.

4. *Garra jerdonia brevimentalia*, var. n.
(Pl. I. figs. 1, 1 a, 1 b.)

I propose to describe this variety in detail, and later briefly indicate the points of difference between it and the foregoing species, *G. jerdonia*, Day.

D. 11 (2/9). P. 12-13. V. 10. A. 8 (1/7). C. 17-18.
L. l. 32. L. tr. $5-5\frac{1}{2}/2\frac{1}{2}-4^*$.

The body is cylindrical, the ventral surface rather broad, compressed behind the vent. The dorsal profile in front of the dorsal fin is distinctly convex and, behind it, gently slopes towards the caudal fin. The ventral profile in front of the ventral fin is equally convex. The height of the body in front of the dorsal fin is contained slightly more than $3\frac{3}{4}$ times in the total length without the caudal fin, and the depth of the caudal peduncle at its narrowest part is less than $7\frac{3}{4}$ in the total length. The head is small comparatively, and its length is contained nearly $4\frac{1}{2}$ times in the total length, and the depth at the occiput is exactly $5\frac{2}{3}$ times in the total length. The upper profile of the head gently slopes down to tip of snout. The eyes, placed in the middle of the head, are small, whose diameter is three in the inter-orbital distance, which is broader than the length of snout. The interorbital space is convex or slightly flat. The snout is obtuse, very faintly grooved between the nostrils, covered with open mucous pores, which are rather small. The upper lip is large and fringed, the mental disk is sub-triangular, the labial fold being nearly as wide as the cartilaginous pad. Both folds are granular. The anterior barbels equal the posterior ones, or are only slightly longer. The chest nearly free from scales†. A very large obtuse angle is formed by the opercular folds with the mental disk. The length of the pectoral fin equals the distance between its anterior root and tip of snout, which also equals the longest dorsal fin-ray. The longest anal and ventral fin-rays nearly equal. The caudal peduncle merges insensibly into the root of the caudal fin, which is lobed. The upper lobe nearly always longer than the ventral lobe. The coloration is variable. Uniform reddish all over, with the lower surface of snout and mental disk redder, or uniform olive-green, somewhat clouded darker on the back. A dark

* $4\frac{1}{2}$ shown in the protograph is incorrect.

† 1913. Annandale, Journ. Proc. As. Soc. Bengal, vol. ix. no. 1, p. 37. This condition is certainly different from the undescribed Manipur form referred to by Dr. Annandale.

pectoral spot. Sides in the green forms are bright yellow, fading into paler yellow on the ventral surface. A dark streak along the middle of the caudal fin and the outer margin of the pectoral and anterior margin of the dorsal fins, somewhat bronzed.

Measurements* in hundredths of total length without caudal fin :—

Total length without caudal fin	mm. 85
Depth of body	25
Depth of caudal peduncle	12·9
Length of head	22·3
Depth of head	17·6
Interorbital space	10·5
Length of snout	9·4
Diameter of orbit	4·6
Distance from tip of snout to anterior end of dorsal fin	47·5
Height of longest dorsal ray	20
Distance between tip of snout to root of pectoral fin	20
Length of pectoral fin	20
Distance from tip of snout to vent	70·5
Distance from tip of snout to anterior end of ventral fin	5·9
Distance from tip of snout to anterior root of anal fin	75·2
Height of longest ventral fin-ray	17·6
Height of longest anal fin-ray	17·2
Length of caudal peduncle	15·2
Length of longest caudal fin-ray	22·3
Height of root of caudal fin	13·5

Type-specimen.—Only six specimens were obtained in the Harangi River (Madapur, Coorg), which is a very rapid stream flowing over rocky beds. The type-specimen and two syntypes have been forwarded to the British Museum and two more to the Indian Museum. The remaining one is kept in the Central College Museum, Bangalore.

The several points of difference between *jerdonia* and *jerdonia brevimentalia* may be summarised thus :—

(1) *Eyes*.—As measured in examples in my own collection and those from the river Bhavani (S. India) and from Kangra Valley (Punjab) belonging to the Indian Museum, they are in *jerdonia* $3\frac{2}{3}$ to 4 in the length of the head and one diameter from end of snout, and two diameters apart. This is in accordance with Day also †.

* References to terminology employed in the measurements :—
1895. Boulenger, Cat. Fish. Brit. Mus. (2nd ed.) vol. i. pp. xi-xii :
1901. Jordan, Proc. M. S. Nat. Mus. vol. xxiii. pp. 737-739.

† Day, Fauna of Brit. India, Fish. vol. i. p. 248.

In *jerdonia brevimentalis*, the eyes are more than four times in the length of the head, 2 diameters from end of snout, and $2\frac{1}{2}$ diameters apart.

(2) *Mental disk*.—In *jerdonia*, broadly subcircular, the lower labial fold is just half the width of the central pad; chest covered with largish scales*.

In *jerdonia brevimentalis*, the mental disk is subtriangular, the lower labial fold nearly equals the width of the pad. Chest nearly free from scales (*vide* Pl. I. fig. 1 a).

(3) *Fins*.—In *jerdonia*, the pectoral fin is shorter than the dorsal, and the ventral shorter than the anal. In *jerdonia brevimentalis* these sets are nearly equal, and the caudal fin is proportionately longer.

(4) The other points refer to the number of fin-rays and scales, which are summarised in the description of *jerdonia brevimentalis*.

5. *Garra platycephala*, sp. n.

(Pl. I. figs. 2, 2 a, 2 b.)

D. 10-11 ($1/9-10$. P. 14-15. V. 10. A. 7-8 ($1/6-7$).

C. 19-20. L. l. 37-39. L. tr. $4\frac{1}{2}/4\frac{1}{2}$.

The head, which is greatly flattened, slopes somewhat abruptly towards the snout, and its length is about five times in the total length without the caudal fin. The depth of the head nearly equals its width behind the eyes. The snout is produced and may be rounded or acute. The diameter of the eye is contained four times in the length of the head, and is only half the interorbital space. It is also less than half the length of snout. End of snout more or less pinched off by a deep groove, which may extend on both sides of the cheek, and both surfaces covered by fairly open mucous pores. Anterior barbels nearly twice as long as the posterior ones, which are hardly visible beyond the hinder labial fold. The outer rays of the pectoral and pelvic fins, which are nearly equal in length, are simple and greatly flattened. The pectoral fin nearly as long as the head or the caudal peduncle. The depth of the caudal peduncle is considerably less than half the height of the longest dorsal fin-ray. The chest is somewhat free from scales or only covered by feebly developed ones. The caudal fin is deeply lobed, the upper lobe being longer.

The colour above is light olivaceous, slightly brownish on the head. Upper part of snout pale blue or grey. Sides of body yellow with a dark green lateral band. Ventral

* 1919. Annandale, Rec. Ind. Mus. pl. xxvii. fig. 3.

surface yellowish. Lower lobe of caudal fin clouded dark, so also the outer margins of the paired fins. A blue pectoral spot may or may not be present. This coloration of fresh specimens fades in preserved forms.

Measurements in hundredths of total length without caudal fin :—

	mm.
Total length without caudal fin	118
Depth of body	17·7
Depth of caudal peduncle.....	10·1
Length of head	20·2
Depth of head	13·5
Width of head behind the eyes	13·5
Length of snout	18·8
Diameter of orbit	5·08
Width of interorbital space	11·01
Distance from tip of snout to anterior root of dorsal fin	42·3
Height of the longest dorsal fin-ray	22·03
Distance from tip of snout to anterior root of pectoral fin	19·4
Longest pectoral fin-ray	18·6-20·1
Distance from tip of snout to vent	56·7
Distance from tip of snout to anterior root of ventral fin	46·6
Longest ventral fin-ray	18·6-19·4
Distance from tip of snout to anterior root of anal fin	74·5
Longest anal fin-ray	15·2
Length of caudal peduncle	20·2
Longest caudal fin-ray	25·4
Height of root of caudal fin-ray	11·8

Type-specimen.—Only three specimens of this fish are included in my collection. The proterotype is sent to the British Museum, and one of the syntypes is presented to the Indian Museum, while the other is kept in the Central College Museum, Bangalore.

Locality.—These specimens were collected in the Cauvery, Seringapatam (Mysore), along with *G. lamta* and *G. stenorhynchia* towards the summer of 1917.

6. *Garra bicornuta*, sp. n.
(Pl. I. figs. 3, 3 a, 3 b.)

D. 11 (2/9). P. 17. V. 12. A. 8 (1/7). C. 20.
L. l. 30-31. L. tr. $3\frac{1}{2}$ -4/ $3\frac{1}{2}$ -4.

The dorsal profile in front of the dorsal fin is broadly convex, and behind the dorsal fin it is nearly horizontal or only very gently slopes down to the caudal fin. The length of the head, which is moderate, is contained slightly less than

$4\frac{1}{2}$ times in the total length without the caudal fin. The greatest depth of body is considerably less than the height of the longest dorsal fin-ray. The depth of the caudal peduncle is contained five times in the distance between the tip of snout and the anterior root of the anal fin. The eyes are large, the diameter of which is contained $3\cdot1$ times in the length of the head is more than half the length of snout and is contained $1\cdot5$ times in the width of the interorbital space. The upper profile of the eye is almost conterminous with that of the protuberance in front of it, and in old examples the tip of the protuberance is studded with spiny mucous pores. The length of the protuberance is nearly half the length of the snout or is $\frac{8}{9}$ of the diameter of the eye. From the anterior margin of the interorbital space, there is a sudden, almost vertical drop. The internasal portion forms almost a third protuberance, which is, however, sunk and which like the orbital processes is covered anteriorly by tubercles. The snout below the nostrils is again sunk and is marked off by deep grooves into four tubercular areas, which are prominent. The anterior barbels are nearly twice as long as the posterior ones. The mental disk is moderate, and the central pad is about $1\frac{1}{4}$ times broader than the lower labial fold, whose posterior margin is nearly straight and at right angle to the long axis of the body. The dorsal and caudal fins are deeply indented. The pectoral and ventral fins are equal in length to the distance between the snout and the anterior root of the former. The anal fin is $1\frac{1}{2}$ times the depth of the caudal peduncle and is longer than the paired fins. The length of the peduncle is $\frac{2}{3}$ of the longest caudal fin-ray. The upper lobe of the caudal fin is much longer than the lower, and the longest ray of the upper lobe may be quite as long as the longest dorsal fin-ray. The outer pectoral and pelvic fin-rays are very stout. The scales are large.

The colour of the older forms is somewhat uniform, slightly reddish brown above, pale yellowish below. The central pad of the disk is rufous, the lower labial fold dark, relieved in front by a white semicircular collar. The greater portion of the paired fins is clouded dark, with brown horizontal streaks in the middle of the caudal fin. In the younger forms the prevailing colour is a warm olive-green above, sides and ventral part yellow. The paired fins are bright orange and the mental disk reddish, the other fins light with brownish streaks. A lateral orange band is occasionally present. Head frequently red or reddish brown or grey.

Measurements in hundredths of total length without caudal fin:—

	mm.
Total length without caudal fin	132
Depth of body	26.5
Depth of caudal peduncle	15.1
Length of head	21.7
Depth of head	19.6
Width of head behind the eyes	15.9
Length of snout	11.5
Diameter of orbit	6.8
Width of interorbital space	10.6
Distance from tip of snout to anterior root of dorsal fin	45.4
Height of the longest dorsal fin-ray	31.06
Distance from tip of snout to anterior root of pectoral fin	19.6
Longest pectoral fin-ray	19.6
Distance from tip of snout to vent	69.6
Distance from tip of snout to anterior root of ventral fin	49.2
Longest ventral fin-ray	19.6
Distance from tip of snout to anterior root of anal fin	75.7
Longest anal fin-ray	22.7
Length of caudal peduncle	18.4
Longest caudal fin-ray	27.2-31.06
Height of root of caudal fin	14.4

Type-specimen.—Several examples of this species are in the collection. The type and three co-types are sent to the British Museum and a similar number of syntypes are presented to the Indian Museum.

Locality.—They were obtained for the first time by my colleague, Mr. A. Subba Rao, from the River Tunga in Shimoga (Mysore State), towards the end of the summer recess in 1917, and have since been obtained by myself from the same source.

Subfamily COBITIDINÆ.

Genus BOTIA.

The occurrence of loaches belonging to this genus in the south of the Deccan has not been reported till now. Dr. B. L. Chaudhuri has described not long ago two new species of *Botia*—viz., *B. birdi** and *B. lohachata*† obtained from Rupar (the Punjab) and from the Gaudak River, Bihar, respectively, and the species described below is therefore the first new one to be mentioned from S. India.

* 1909, Chaudhuri, Rec. Ind. Mus. vol. iii. p. 339.

† 1912. *Id. op. cit.* vol. vii. p. 441, pl. xl. fig. 2.

7. *Botia striata*, sp. n.

(Pl. II. figs. 4, 4 a, 4 b.)

D. 11-12 (2/9-10). P. 13-14. V. 8. A. 7-8 (1/6-7). C. 19.

The body is greatly compressed laterally and the dorsal profile in the front of the dorsal fin is a broad incline, which becomes an abrupt descent from the eyes to the snout. The depth of body is contained about $3\frac{1}{2}$ times in the total length without the caudal fin, and is only very slightly greater than the length of head. The caudal peduncle is almost squarish, being slightly deeper than long. The head is greatly compressed, and its length is nearly equal to the distance between the tip of snout and the anterior root of pectoral fin. The width of head is just half its own depth. The eyes are moderate, their diameter is contained five times in the length of the head and is slightly more than half the length of the suborbital spine. The spine is bifid at the base. Barbels 8, subequal, the shortest pair being the mandibular ones. The mouth is crescentic when shut and is an oval aperture when open. The distance between the angles of the mouth, if widely opened, is equal to the diameter of the orbit. The upper lip overhangs the lower, both somewhat thick and suctorial. The dorsal fin arises in front of the root of the ventrals and both are behind the middle point in the total length of body without the caudal fin. The height of the dorsal fin is equal to the length of the anal fin, and the ventral* is shorter than these two. The length of the pectorals is less than twice the length of the suborbital spine and is longer than the snout. The margin of the dorsal fin is entire, that of the dorsal fin is deeply lobed, the lobes being equal. The anterior nostril is surrounded by a very broad glandular fold, which covers the posterior nares; the opening of the latter is a wide funnel, that of the former is a slit masked by the glandular lips of the fold. Muciferous glands are few, present on the head and on the sides of the operculum. The lateral line is entire and straight, terminating anteriorly in the upper corner of the gill-opening; is rarely continued forward by a row of muciferous glands. Scales are absent on the head, operculum, and chest. They are small and non-deciduous.

The colour of this loach is most beautiful. The body is diversified by broad dark and narrow yellow bands, which from behind the nape form oblique hoops directed backwards; these bands completely surround the body. The

* In fig. 4 the ventral fin is slightly exaggerated, so also is the lower lobe of the caudal fin.

broad dark bands may bear light streaks of variable number, forming complete or incomplete hoops. These narrow white bands may be broken into small elegant dots. This beautiful pattern may be on a background of a pale pink or a deep yellow. These two primary types of dark and yellow bands are broader on the sides of the head and are directed obliquely forwards. On the upper surface of the head, the dark and yellow streaks form a trident mark. The posterior part of the caudal peduncle may be clouded by a deep bronze, which obscures occasionally the scheme of bands and dots. The chest is somewhat greenish in freshly captured specimens, fading almost into a white in the preserving fluids. The fins are white and are barred, the caudal fin bearing two entire and two to three interrupted stripes. The whole scheme of striation on the body is suggestive more of the zebra.

Measurements in hundredths of total length without caudal fin:—

	mm.
Total length without caudal fin	70
Depth of body	29.5
Depth of caudal peduncle.....	17.1
Length of head	28.5
Depth of head.....	22.8
Width of head behind eyes	11.4
Length of snout	15.7
Diameter of orbit	5.7
Width of interorbital space (measured over the arch of head)	14.2
Width of interorbital space (measured across head)	9.5
Width of mouth	7.1
Distance from tip of snout to anterior root of dorsal fin	57.1
Height of longest dorsal fin-ray	14.2
Distance from tip of snout to anterior root of pectoral fin	28.5
Longest pectoral fin-ray	18.5
Distance from tip of snout to vent	74.2
Distance from tip of snout to anterior root of ventral fin	62.9
Longest ventral fin-ray	13.5
Distance from snout to anterior root of anal fin	85.7
Longest anal fin-ray	14.2
Length of caudal peduncle	16.6
Longest caudal fin-ray	25.7
Height of root of caudal fin	17.1

Type-specimen.—There are eleven specimens in the collection. The type and four more examples are sent to the British Museum and four presented to the Indian Museum. The rest is kept in the Central College Museum, Bangalore.

Locality.—These loaches have been obtained in the River Thunga, Shimoga Town, Mysore State, South India.

Genus NEMACHILICHTHYS.

It is rather doubtful whether the species called by Sykes *Cobitis ruppelli** is identical with Day's *Nemachilichthys rueppelli*†. The type of this species, described by Day, is in the Indian Museum, and is not in a condition for a detailed examination. One has to supplement therefore very largely from his figure, which, however, is a photograph. Sykes gives the following formula for his *C. ruppelli*:—

- (1) D. 13 (1/12). P. 12. V. 8. A. 8. C. 19; and
(2) D. 13 (2/11). P. 13. V. 8. A. 7 (2/5). C. 19, is Day's diagnosis.

The coloration of Sykes's figure has nothing whatever to do with Day's *rueppelli*, though his description is quite different. It is further mentioned by Sykes that his species is nearly cylindrical, scaleless, not much thicker than a large goose-quill, and from two or three inches long. Day's specimen is slightly under three inches, and does not fit in with the above description. Sykes mentions that the dorsal fin in his specimen of *ruppelli* is longer than any except the caudal, and in Day's specimen it is certainly shorter than the anal also. Then, the tail-fin in *C. ruppelli*‡ is described as "rather notched than forked," while in Day's type it is deeply forked. I have for these reasons some hesitation in regarding that Day was correct in thinking that *Cobitis ruppelli* is identical with *N. rueppelli*.

8. *Nemachilichthys shimogensis*, sp. n. (Pl. II. figs. 5, 5 a, 5 b.)

D. 14 (2/12). P. 12–13. V. 8. A. 7 (2/5). C. 20.

The dorsal profile in front of the dorsal fin is horizontal up to the upper margin of the eyes, and the profile of the head in front of the eyes is a steep incline. The upper surface of the body is, in fresh and well-preserved specimens, excavated by two trough-like depressions, the anterior between the dorsal fin and the occiput, and the posterior one from the dorsal fin to the end of caudal peduncle. On the

* 1841. Sykes, Trans. Zool. Soc. p. 366, pl. lxiv. fig. 1.

† 1878. Day, Fish. Ind. p. 612, pl. clvi. fig. 7.

‡ Sykes's *ruppelli* may be some local variety of *Cobitis cilturis* (should be *bilturi*) H. B. or *Cobitis botius* H. B. (Fish. Ganges, pp. 350, 394), for Sykes himself acknowledges close affinity between his *Mureh* (*ruppelli*) and Hamilton and Buchanan's *bilturi*.

ventral surface there are similarly two deep grooves, one between the base of the ventral and anal fins, and the second between the latter and the root of the caudal fin. The depth of body is contained $5\frac{2}{3}$ times in the total length without the caudal fin. The dorsal surface of head is convex and its length is contained about four times in the total length. The depth of head is less than half its length, and its width behind the eyes is contained slightly more than $2\frac{1}{2}$ times in the cephalic length. End of snout blunt and elevated, and its length is more than half the length of head. The upper surface of head is also convex. The lumen of the mouth when shut is horseshoe-shaped; its upper lip produced into a forward fleshy fold and the lower lip divided into two fleshy protuberances. The barbels (six) are subequal, thick at the base, and flagellate towards the tips. The eyes are directed upwards and their diameter is 3 in the length of snout and they are less than one diameter apart. The nostrils are separated by a glandular fold, which, reflected back, covers the posterior nares. On both sides of the snout there is a fairly deep muciferous canal or groove, which arises near the tip of snout and may stop in front of the eyes or may be continued below and behind them. Muciferous glands are few, scattered on the snout and head. The perpendicular from the first dorsal fin-ray passes through the middle point in the total length without the caudal fin, and the height of the dorsal ray equals the pectoral. The ventral fin is equal to either of these or is shorter. The longest anal ray exceeds the length of the caudal peduncle. The depth of the caudal peduncle is less than its own length, and corresponds to the width of head behind the eyes. The tail-fin is deeply forked, the two lobes being equal. The longest tail fin-ray is shorter than the distance between the tip of snout to anterior root of pectoral fin. The scales are small and non-deciduous, absent on the head, chest, and nearly the whole abdomen. The lateral line is entire and is somewhat concave in the anterior half of the body.

The colour is a beautiful orange with brown bars, continuous dorsally and descending to the ventral margin of the body. A few shorter intermediate bars also present. The unbroken bands being from 15 to 20. The dorsal fin is barred and the black dots thrown into relief by a white edge below each. The caudal fin is chevroned with brown. An almost ocellus-like blue spot in the middle of the root of the tail-fin. Head in freshly captured specimens is brownish or reddish. Throat is white, and the whole of the abdominal surface is orange.

Measurements in hundredths of total length without caudal fin :—

	mm.
Total length without caudal fin	85
Depth of body	17·6
Depth of caudal peduncle	10·0
Length of head	25·2
Depth of head	11·7
Width of head behind eyes	10·0
Length of snout	14·1
Diameter of orbit	4·7
Width of interorbital space	3·5
Width of mouth	5·8
Distance from tip of snout to anterior root of dorsal fin	50·5
Height of longest dorsal fin-ray	16·4
Distance from tip of snout to anterior root of pectoral fin	24·7
Longest pectoral fin-ray	16·4
Distance from tip of snout to vent	68·2
Distance from tip of snout to anterior root of ventral fin	56·4
Longest ventral fin-ray	16·4-16·2
Distance from tip of snout to anterior root of anal fin	82·7
Longest anal fin-ray	14·1
Length of caudal peduncle	12·9
Longest caudal fin-ray	20·2
Height of root of caudal fin	11·8

Type-specimen.—Several specimens are contained in the collection. The type and about six syntypes are forwarded to the British Museum and a number of examples are presented to the Indian Museum.

Locality.—Obtained from the Thunga River, Shimoga Town (Mysore), S. India. A few examples of this species and the foregoing were taken by my colleague, Mr. A. Subba Rao, from the same source.

EXPLANATION OF THE PLATES.

PLATE I.

Fig. 1. Garra jerdonia brevimentalia, var. n. $\frac{1}{2}$ nat. size.

Figs. 1 a, 1 b. Ditto. $\times \frac{3}{4}$.

Fig. 2. Garra platycephala, sp. n. $\frac{1}{2}$ nat. size.

Figs. 2 a, 2 b. Ditto. $\times \frac{3}{4}$.

Fig. 3. Garra bicornuta, sp. n. $\frac{1}{2}$ nat. size.

Figs. 3 a, 3 b. Ditto. $\frac{1}{2}$ nat. size.

PLATE II.

Fig. 4. Botia striata, sp. n. $\times \frac{3}{4}$.

Figs. 4 a, 4 b. Ditto. $\times \frac{3}{4}$.

Fig. 5. Nemachilichthys shimogensis, sp. n. \times slightly more than $\frac{3}{4}$.

Figs. 5 a, 5 b. Ditto. \times slightly more than $\frac{3}{4}$.

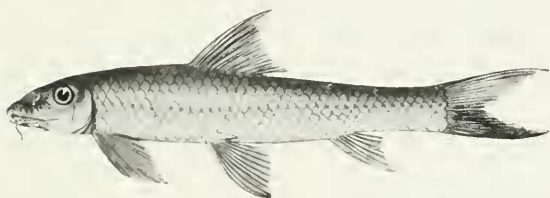
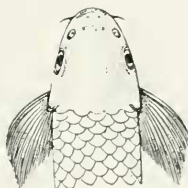


1

1a



1b

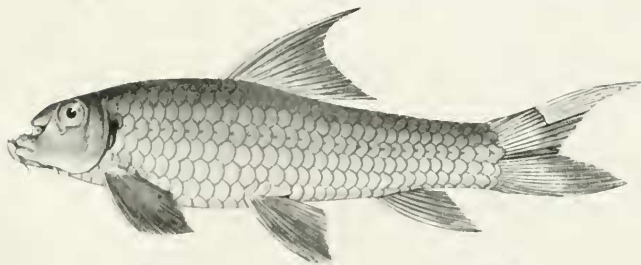
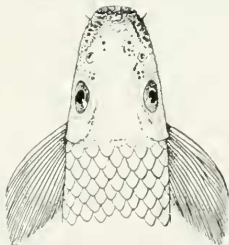


2

2a



2b



3

3a



3b





4



4a



4b



5



5a



5b